spectrum. Knowing the density of the relaxation-time spectrum, it is possible to calculate the average relaxation time τ_{α}, which characterizes the average lifetime of the Fourier components of the concentration fluctuations. It turns out here that τ_{α} increases sharply in the vicinity of the critical point and retains rather large values in a fairly wide interval of concentrations and temperatures. This can be used to explain the attenuation of the diffusion in the vicinity of the critical point [3,4].

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CATHODOLUMINESCENCE OF SOLID XENON IN THE ULTRAVIOLET REGION OF THE SPECTRUM

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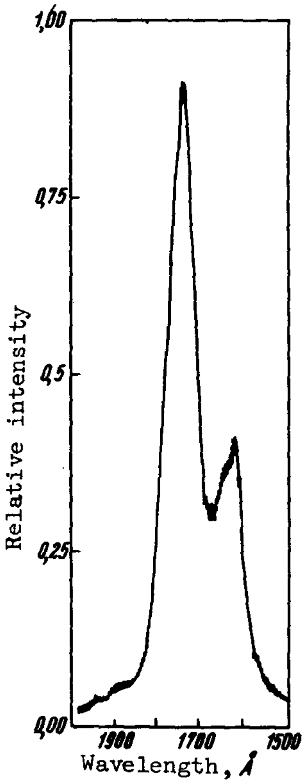
In view of the fact that the effective temperature of an electron beam used as a laser-pump source is very high, this method can be used to excite practically all energy levels. We observed the luminescence of solid xenon grown from the gas phase and bombarded with fast electrons. The luminescence spectrum (see the figure) consists of two lines. 1735 and 1620 Å. The width of the more intense line is ~70 Å and the distance between lines is ~115 Å. The spectra were recorded with a vacuum spectrometer with a diffraction grating; the spectrum shown in the figure was recorded at a spectrometer resolution ~ 2.5 Å. The electron energy was 300 - 400 keV, the electron-current pulse duration was 50 nsec, and the pulse repetition frequency was 10 Hz. The initial xenon was ~99.5% pure. The crystal temperature was maintained within the range 60 - 70°K. The total power of one emission pulse reached several hundred watts.



Luminescence spectrum of solid xenon subject to electron excitation.

The observed luminescence is apparently connected with the emission of localized excitons. The Stokes shift of the emission line is 2 eV. A Stokes shift of like magnitude was observed in [1], where measurements were made of the luminescence spectra of solid xenon excited by α particles from a radioactive source (5 mCi and Po^{210}). The luminescence spectrum in the cited investigation consisted of one line near 1730 Å of width ~100 - 120 Å. The excitation intensity was much lower in [1] than in our investigation. The high luminescence efficiency of solid xenon, the absence of absorption in the region of the emission line, and the realistic values of the threshold pump power (according to estimates given in [2]) point to the possibility of attaining laser action in solid xenon excited by electrons.

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NONLINEAR ION-ACOUSTIC WAVES IN A PLASMA

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It is well known [1] that ion-acoustic oscillations can propagate in a rarefied plasma with hot electrons ($T_e \gg T_i$, where $T_{e,i}$ - electron or ion temperature). The dispersion law $\omega = \omega(k)$ for such oscillations (neglecting the weak damping) is

$$\omega^2 = \frac{4\pi n e^2}{M}\frac{k^2}{k^2+\kappa^2},$$

and in the limiting case of large wavelengths, $k \ll \kappa$ ($1/\kappa$ - Debye radius) it corresponds to an adiabatic exponent $\gamma = 1$.

Ion-acoustic waves of small amplitude in a gas-discharge plasma have been thoroughly investigated recently [2,3]. Great interest attaches to the nonlinear dynamics of the propagation of such waves, especially since a nonisothermal plasma is a typical example of a strongly dispersive medium with small absorption.

Propagation of nonlinear stable elementary waves, such as compression solitons [4-6], is possible in such a medium, and in general any initial perturbation will disintegrate in time into an aggregate of such elementary oscillations with wavelength on the order of the characteristic dispersion length (in this case the Debye radius).

We describe briefly an experiment in which we were able to trace how an initially smooth disturbance of large amplitude in a nonisothermal plasma disintegrates as a result of non-

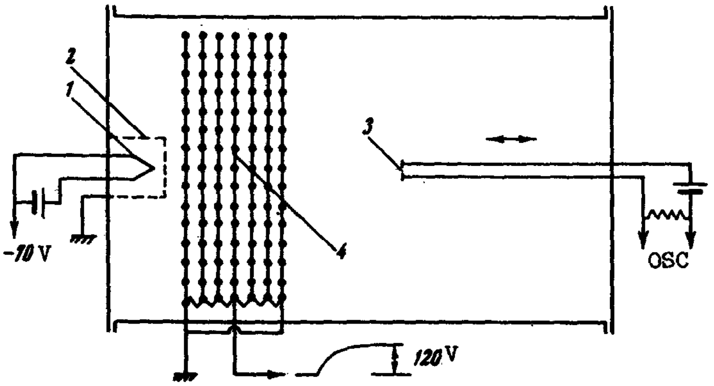

Fig. 1. Experimental setup:
1 - incandescent cathode,
2 - grid, 3 - plasma absorber,
4 - plasma source.